Stoller
Grand Junction Office established 1959

GJO-2003-498-TAC

299-E13-18 (A5863)
Log Data Report

Borehole Information:

Borehole: 299-E13-18 (A5863)			**Site:** 216-B-34 Trench		
Coordinates (WA State Plane)		**GWL (ft)[1]:** 333.7		**GWL Date:** 9/29/03	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
134,216.14 m	573,118.63 m	Feb. 1957	224.13 m	458	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	1.8	6 5/8	6	5/16	+1.8	99.8
Welded steel	0	8 5/8	8	5/16	0	436.8

The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. Casing depths are from Ledgerwood (1993).

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS[3], and Ledgerwood (1993). Zero reference is the top of the 6-in. casing.

Logging Equipment Information:

Logging System:	Gamma 1G		**Type:** 35% HPGe (34TP10967A)
Calibration Date:	4/2003	**Calibration Reference:**	GJO-2003-438-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3/Repeat	4	5
Date	9/29/03	9/30/03	10/01/03	10/01/03	10/01/03
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	77.0	333.0	198.0	163.0	100.0
Finish Depth (ft)	2.0	164.0	164.0	99.0	76.0
Count Time (sec)	200	100	100	100	200
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A[4]	N/A	N/A	N/A	N/A
Pre-Verification	AG019CAB	AG020CAB	AG021CAB	AG021CAB	AG021CAB
Start File	AG019000	AG020000	AG021000	AG021035	AG021100
Finish File	AG019075	AG020169	AG021034	AG021099	AG021124

Log Run	1	2	3/Repeat	4	5
Post-Verification	AG019CAA	AG020CAA	AG021CAA	AG021CAA	AG021CAA
Depth Return Error (in.)	-1	0	N/A	N/A	-1
Comments	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section.	No fine-gain adjustment.	No fine-gain adjustment.

Logging Operation Notes:

Zero reference was top of the 6-in. casing. Logging was performed with a centralizer installed on the sonde for spectral data only starting with file prefix AG019. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 118. During SGLS logging, fine-gain adjustments were not needed. Maximum logging depth achieved was 333 ft, approximately 1 ft above groundwater.

Analysis Notes:

Analyst:	Sobczyk	Date:	10/06/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. All of the verification spectra were within the control limits. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 2.5 percent lower and 3.6 percent higher at the end of the day.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. The post verification spectra were used to determine the energy and resolution calibration for processing the SGLS data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1GMay03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 6-in. casing. On the basis of Ledgerwood (1993) and the total gamma response, the casing configuration was assumed to be a string of 8-in. casing to the maximum depth of the logging (333 ft) and a string of 6-in. casing to 100 ft. Casing correction factors were calculated assuming a total casing thickness of 5/8 in. from 0 to 100 ft and 5/16 in. from 100 to 333 ft. These are the measured values for these casing materials. Where more than one casing exists at a depth, the casing correction is additive (e.g., 5/16 + 5/16 = 5/8 would be the combined thickness for the 6-in. and 8-in. casings). Water and dead time corrections were not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 609 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 1764 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected at 5 ft with a concentration of 0.4 pCi/g. ^{137}Cs was also detected at 70, 105, 171, 192, 235, and 328 ft with a concentration near the MDL (0.3 pCi/g). After examination of the individual spectra, it was determined that there is no

evidence of a photopeak at 662 keV at the depths of 70, 105, 171, 192, 235, and 328 ft. These reported peaks are probably the result of statistical fluctuation.

A recognizable change in the KUT logs occurred in this borehole. A gradual 5-pCi/g increase in ^{40}K concentrations occurs between 21 and 41 ft. Relative to the surrounding sediments, apparent ^{40}K concentrations are elevated by approximately 4 pCi/g in the interval between 250 and 271 ft, which indicates a transition to finer grained sediments.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the man-made radionuclides (662 keV) and natural radionuclides (609, 1461, 1764, and 2614 keV). The ^{137}Cs concentration based on 662-keV photopeak did not repeat at 171 and 192 ft.

Gross gamma logs from Additon et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of man-made gamma radiation from 1958 through 1968. The log from 5/3/76 appears to detect background levels of gamma radiation. The logs from 5/2/58, 5/27/59, 5/13/63, and 4/24/68 appear to detect relatively high gamma activity in the interval from 36 ft (8 m) to 26 ft (11 m). The SGLS did not detect any man-made radionuclides in this interval.

References:

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Well*s, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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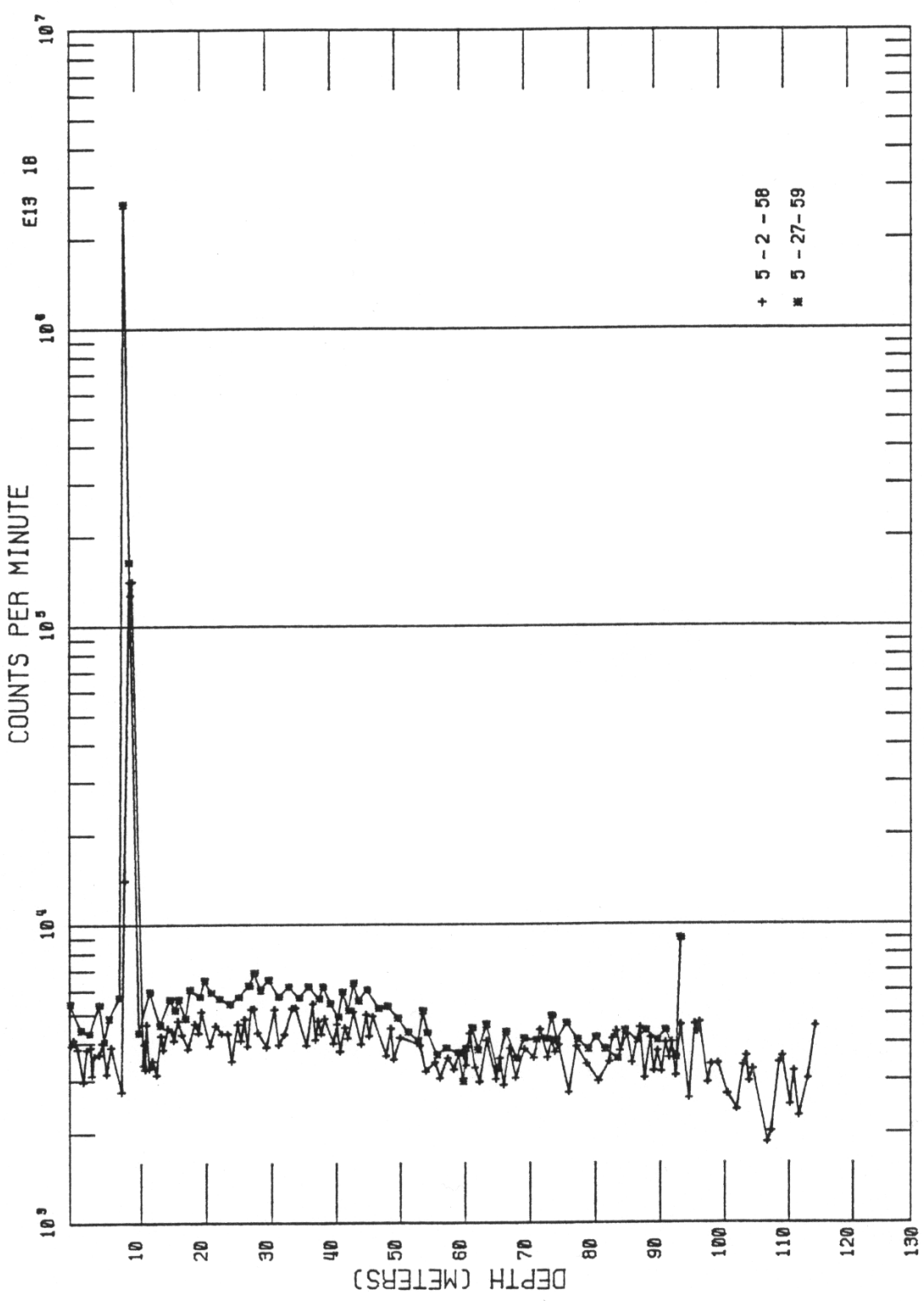
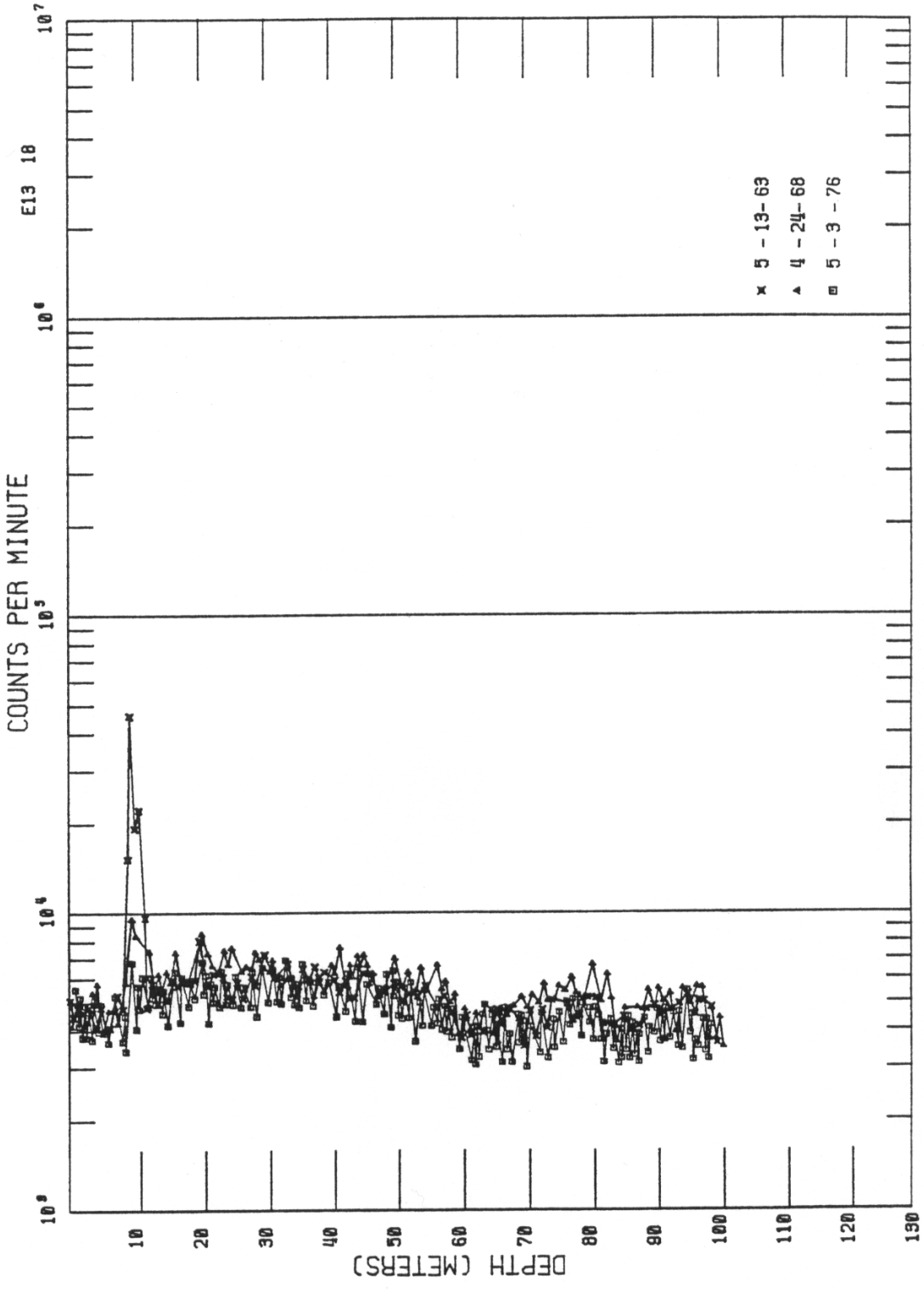
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable



from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E13-18, Logged on 5/2/58 and 5/27/59

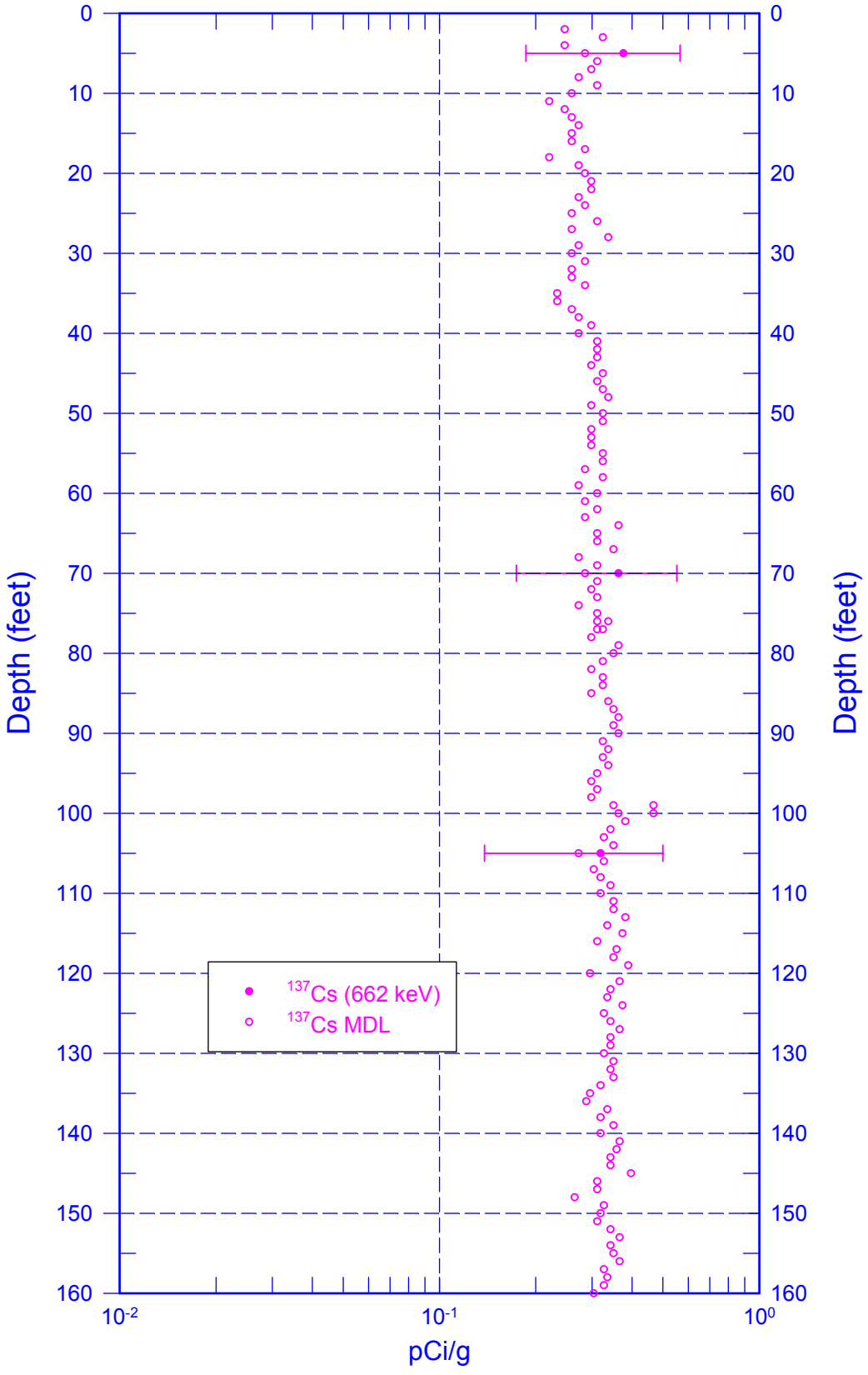


from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E13-18, Logged on 5/13/63, 4/24/68, and 5/3/76

299-E13-18 (A5863)

Man-Made Radionuclides

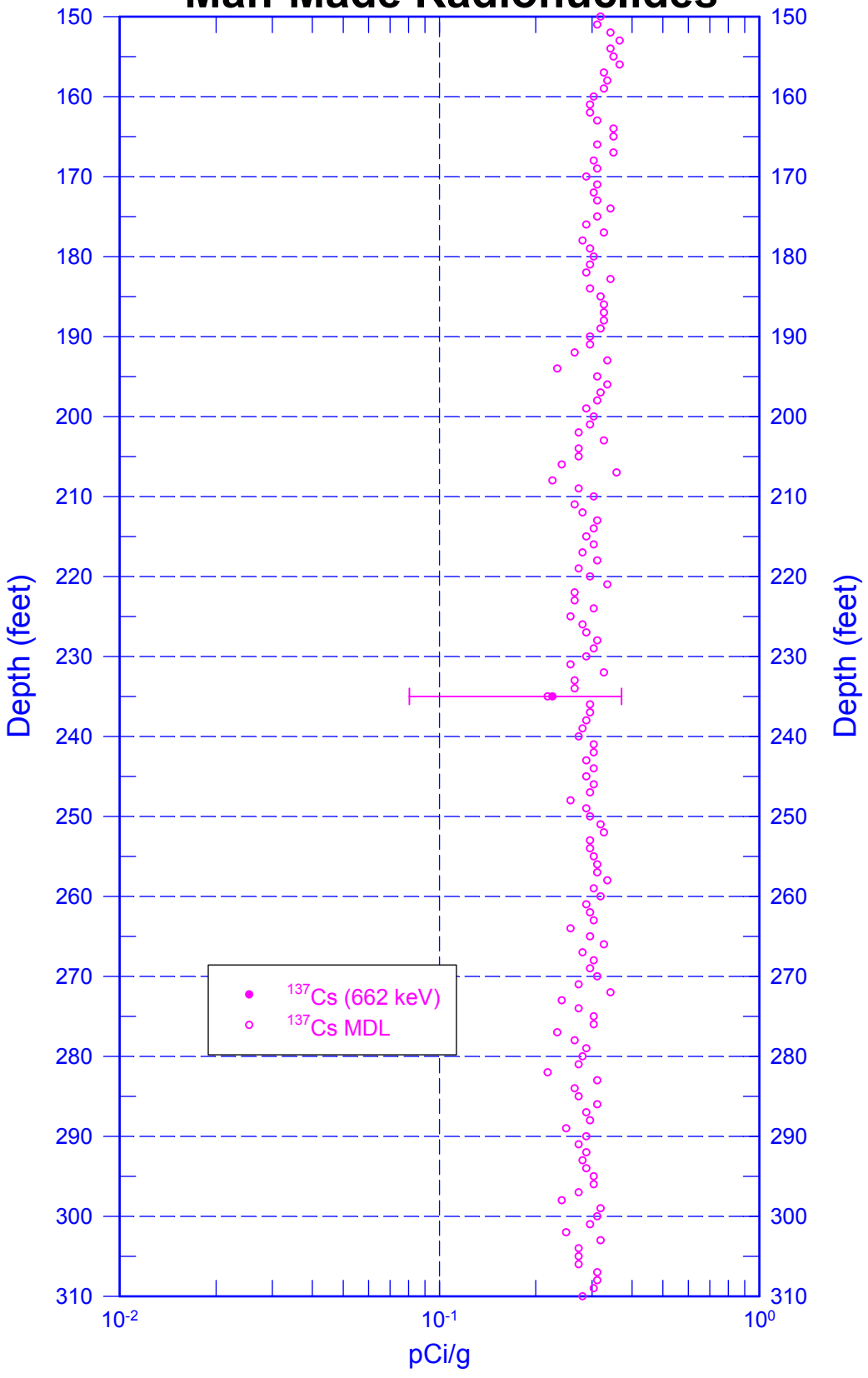


Zero Reference = Top of Casing

Date of Last Logging Run
10/01/2003

299-E13-18 (A5863)

Man-Made Radionuclides



Zero Reference = Top of Casing

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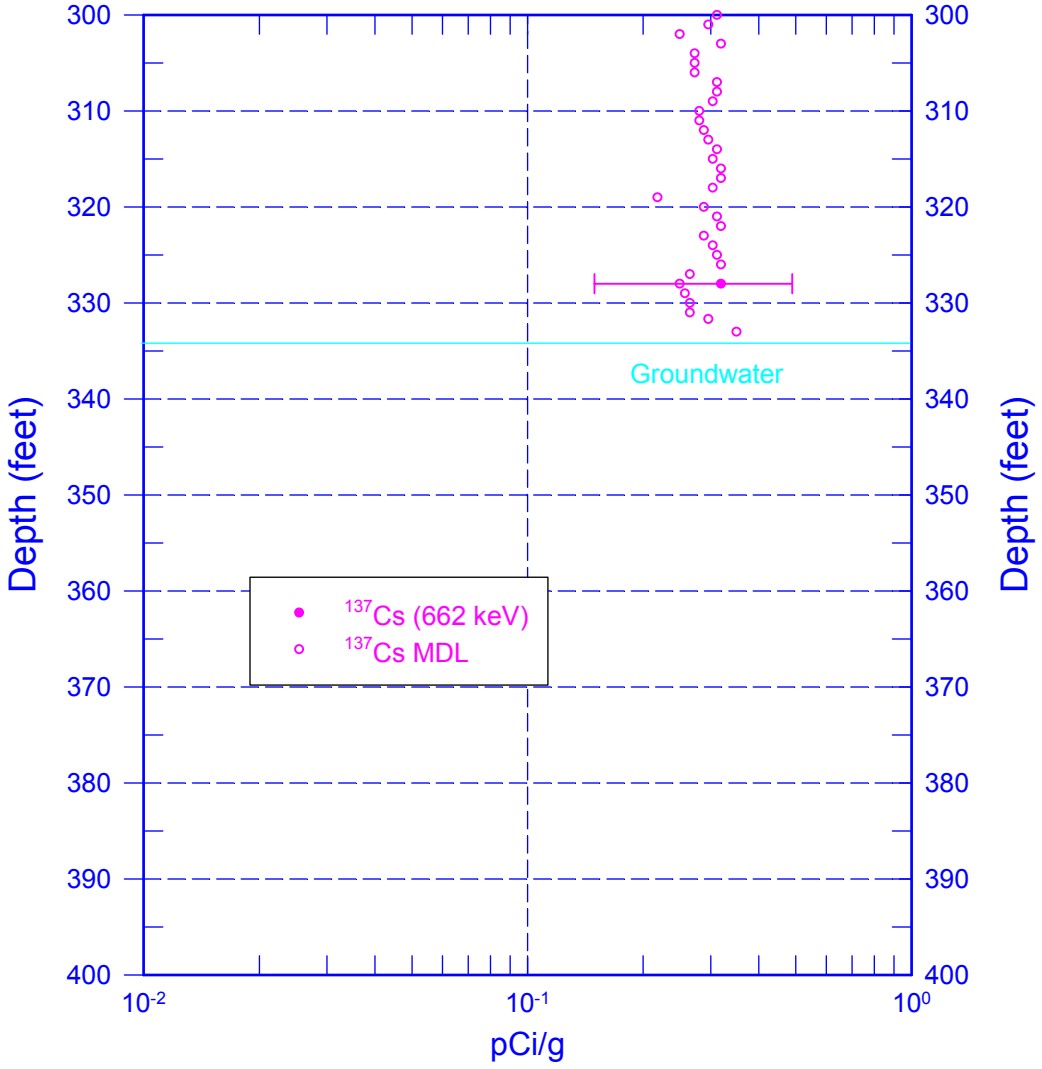
10/01/2003

299-E13-18 (A5863)
Man-Made Radionuclides



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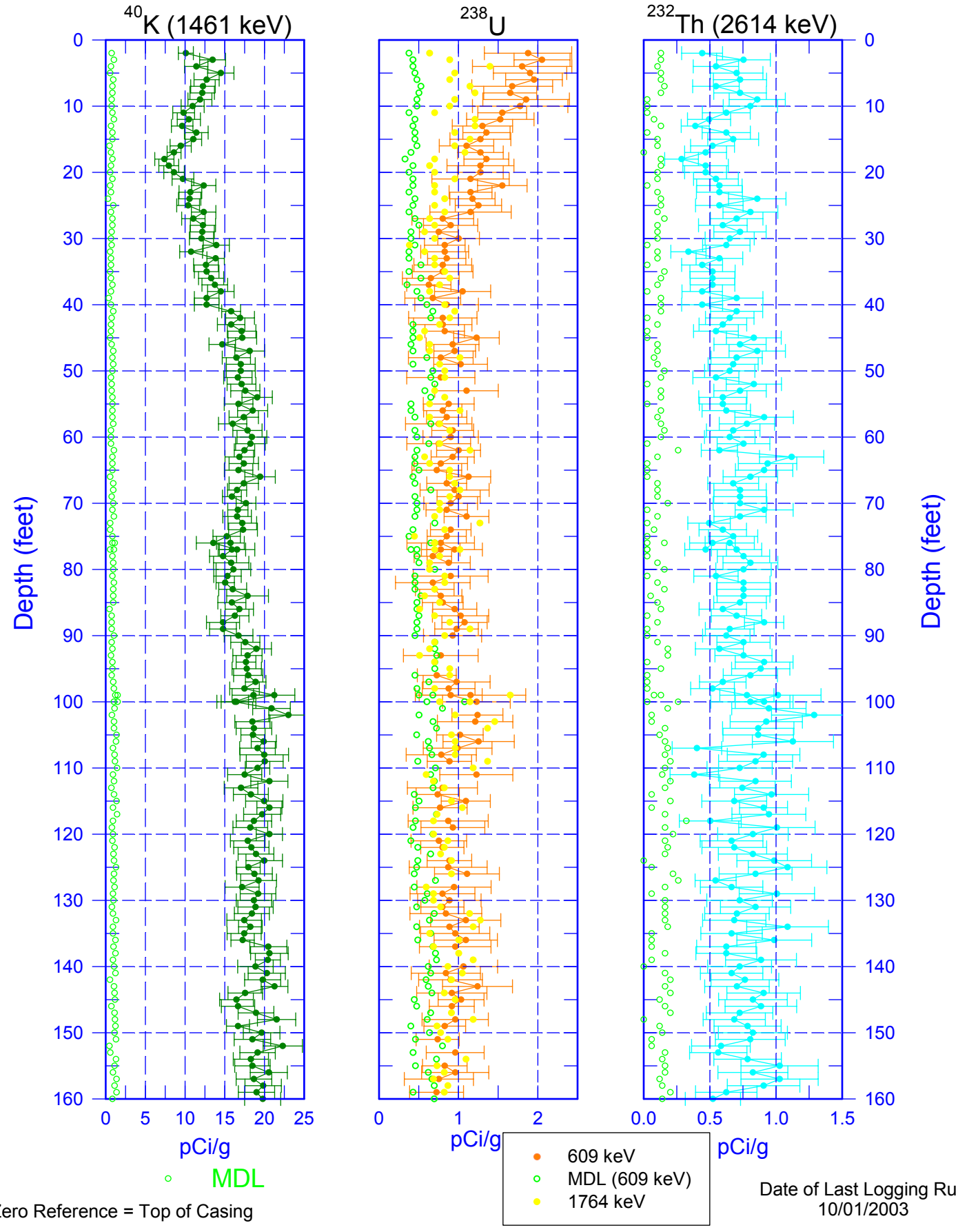
Date of Last Logging Run
10/01/2003

299-E13-18 (A5863)
Natural Gamma Logs



Zero Reference = Top of Casing

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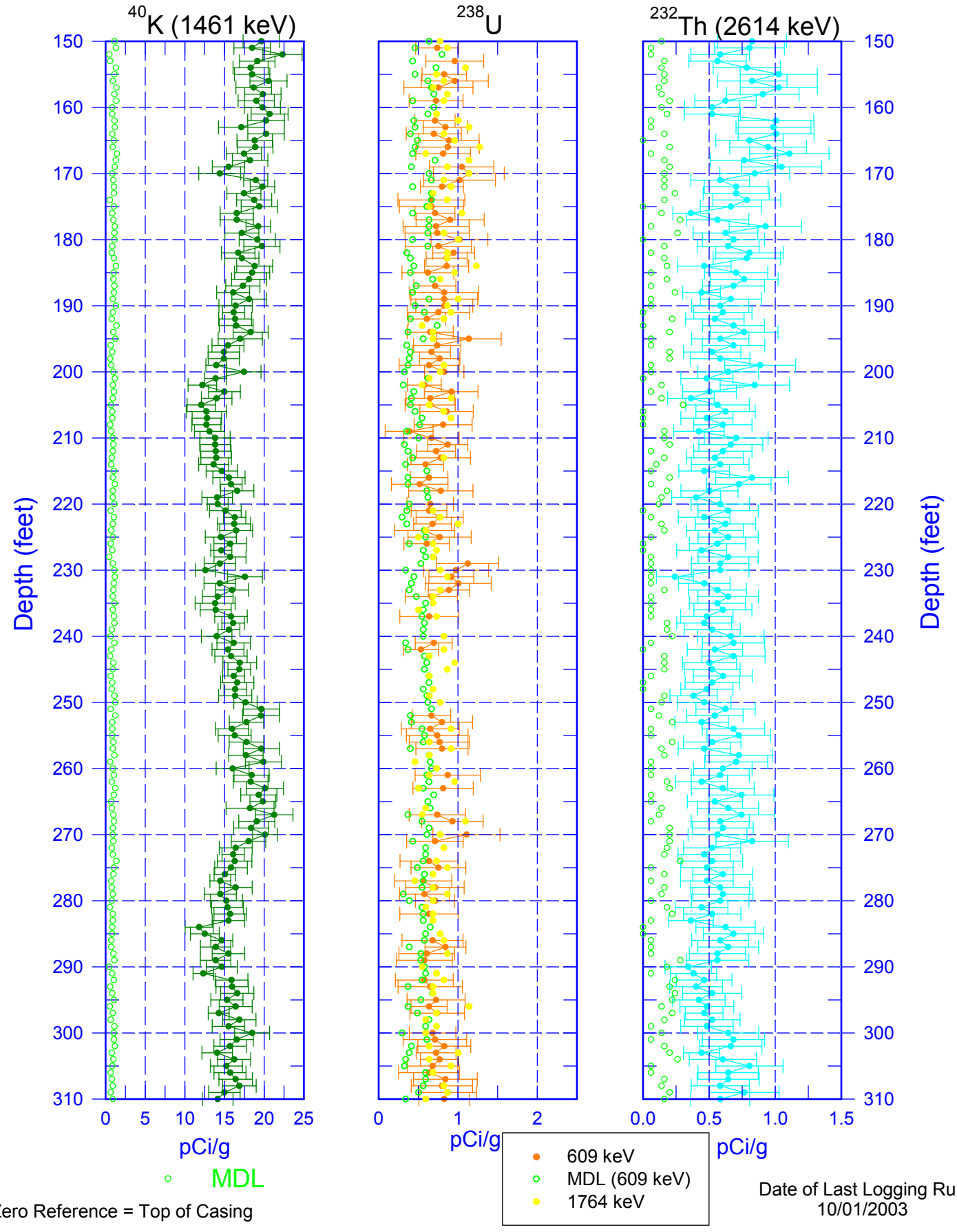
Natural Gamma Logs



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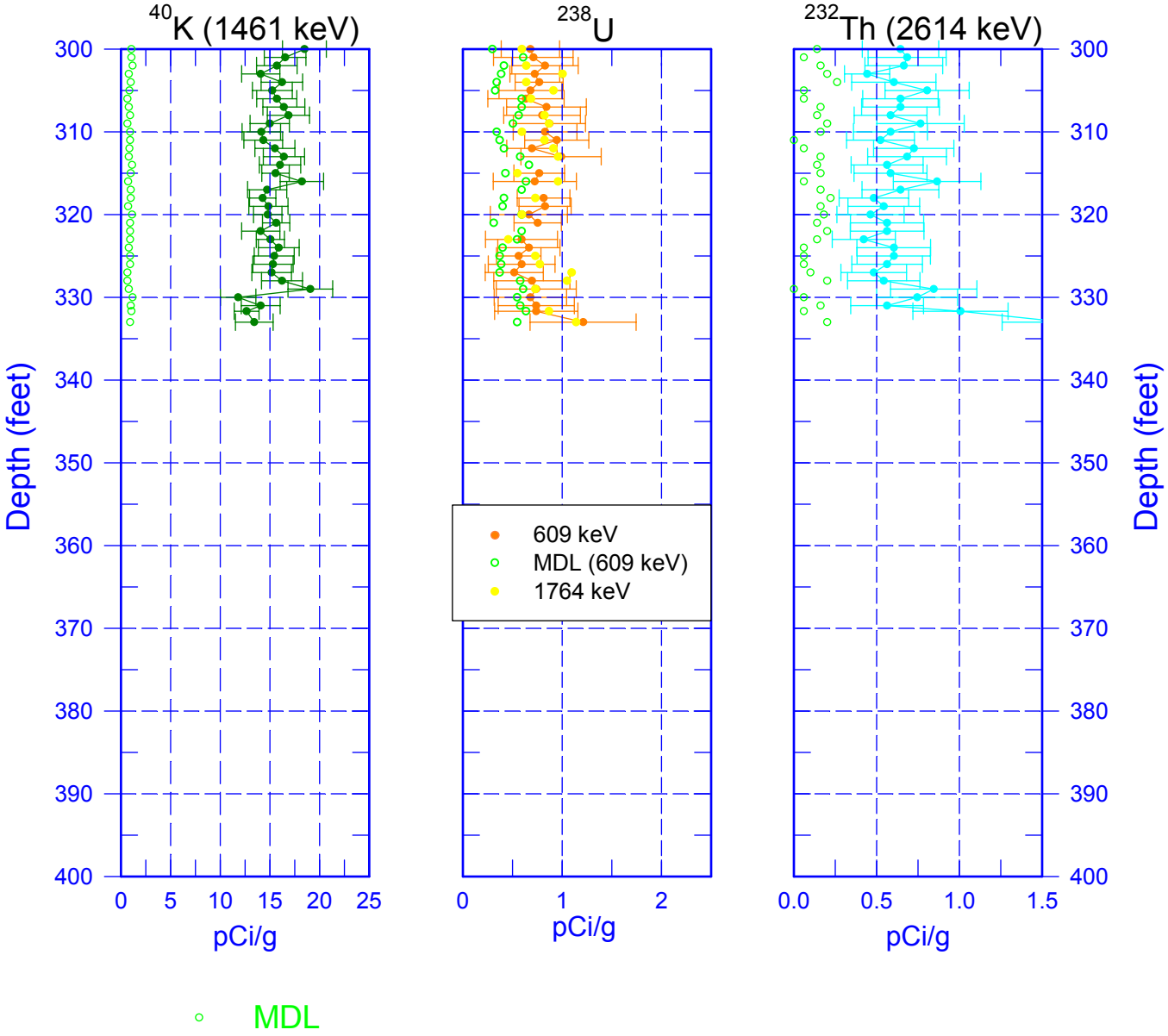
Natural Gamma Logs



Zero Reference = Top of Casing

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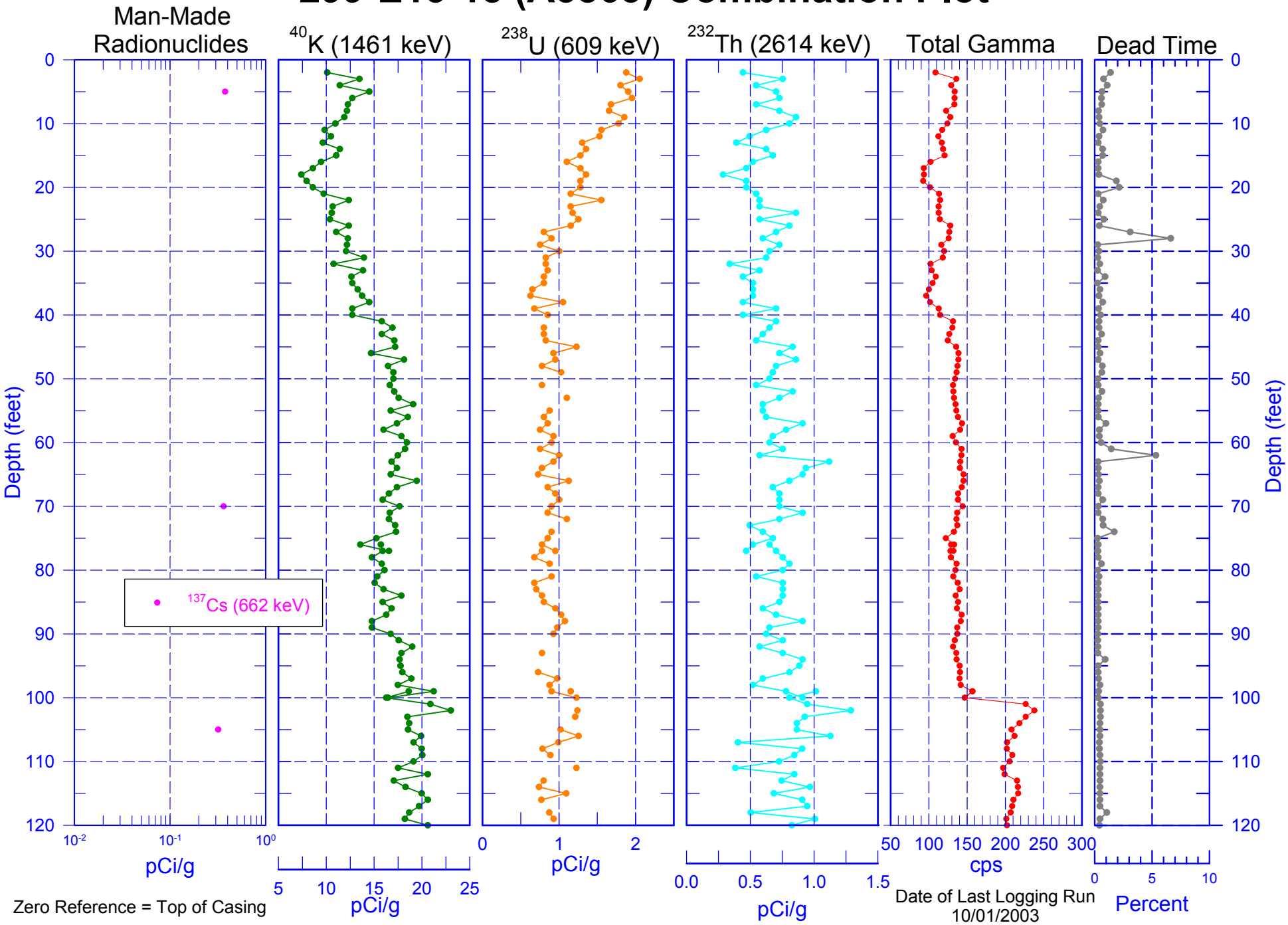
299-E13-18 (A5863) Combination Plot



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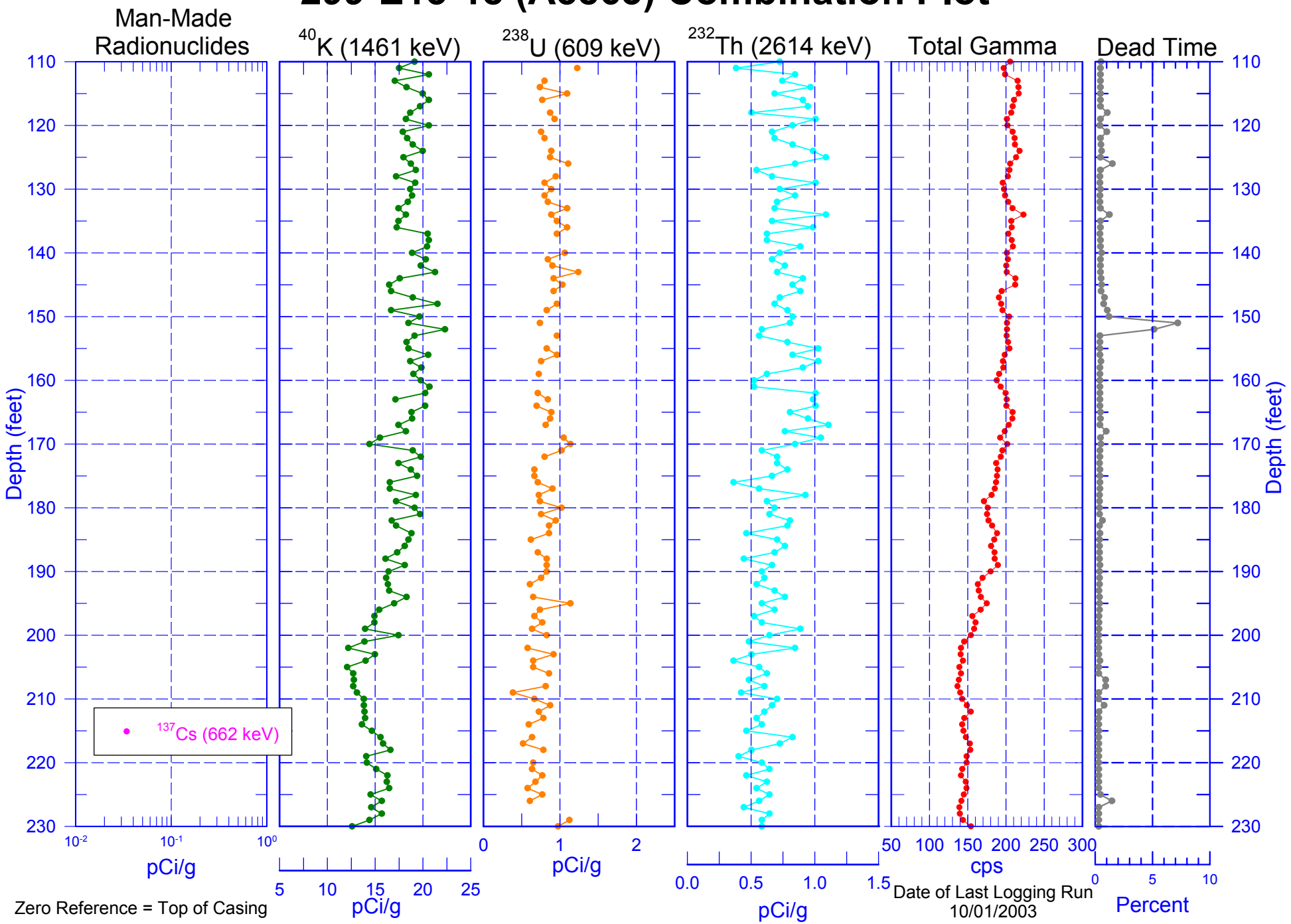

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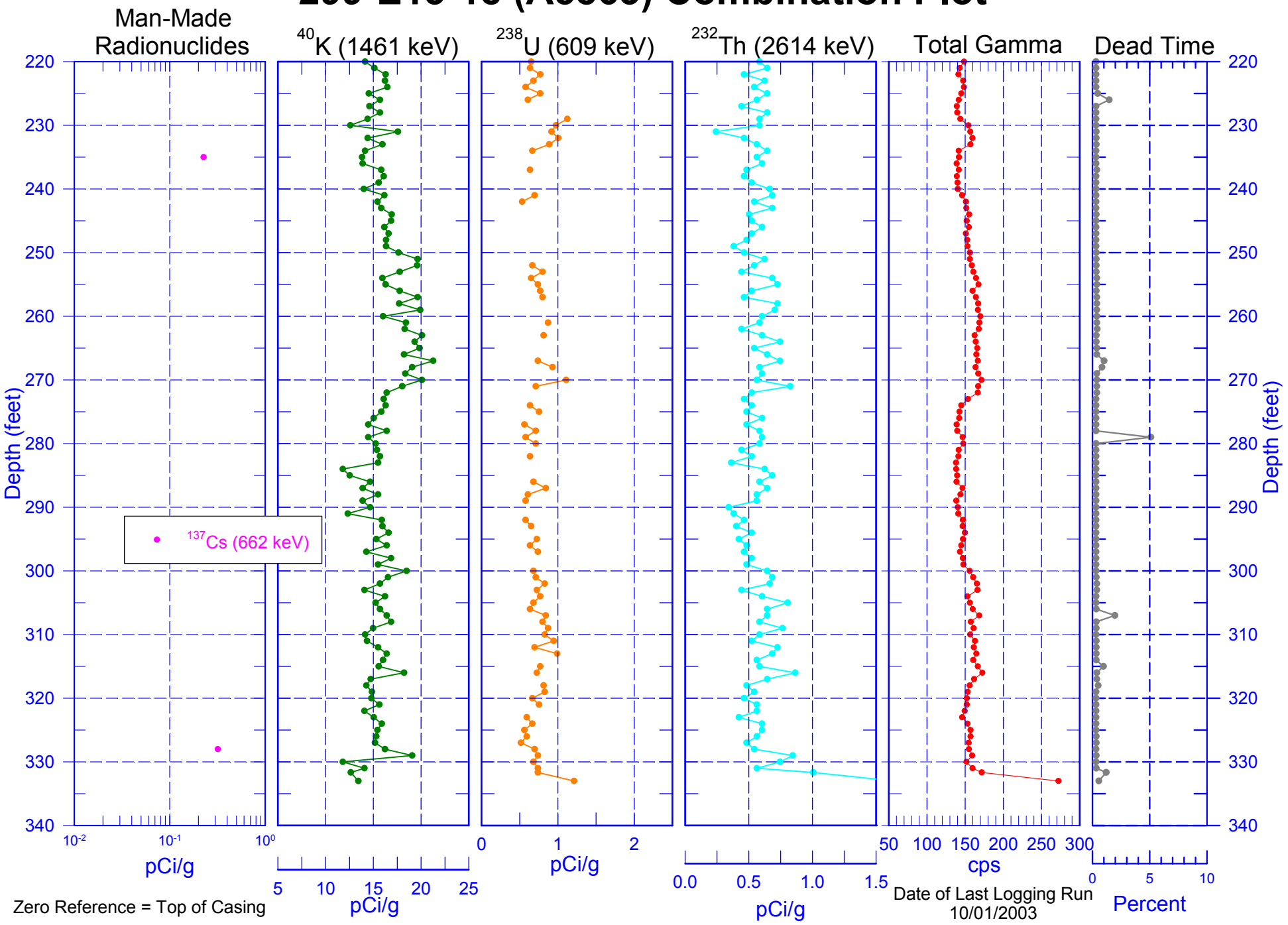
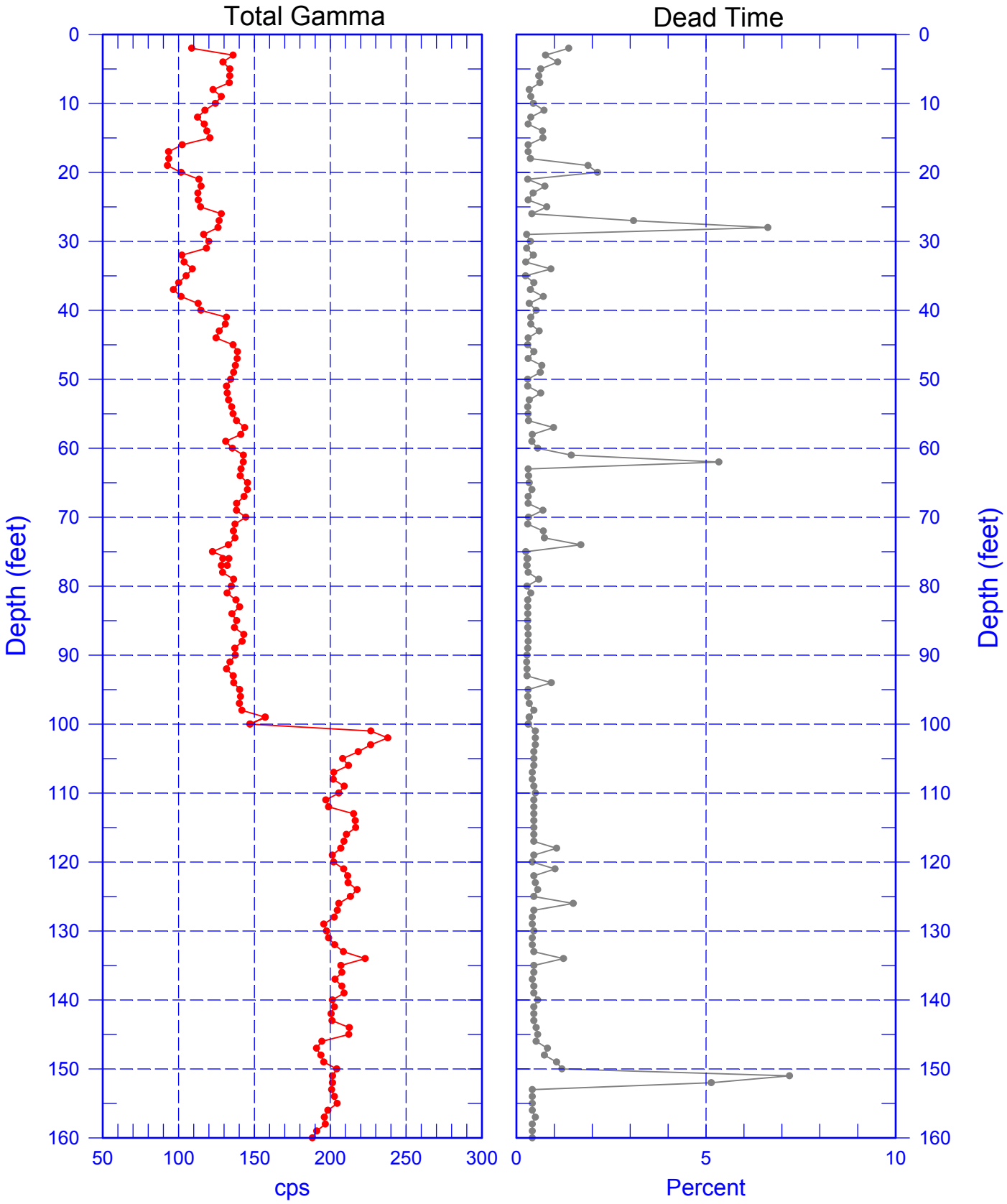


299-E13-18 (A5863)
Total Gamma & Dead Time



Zero Reference = Top of Casing
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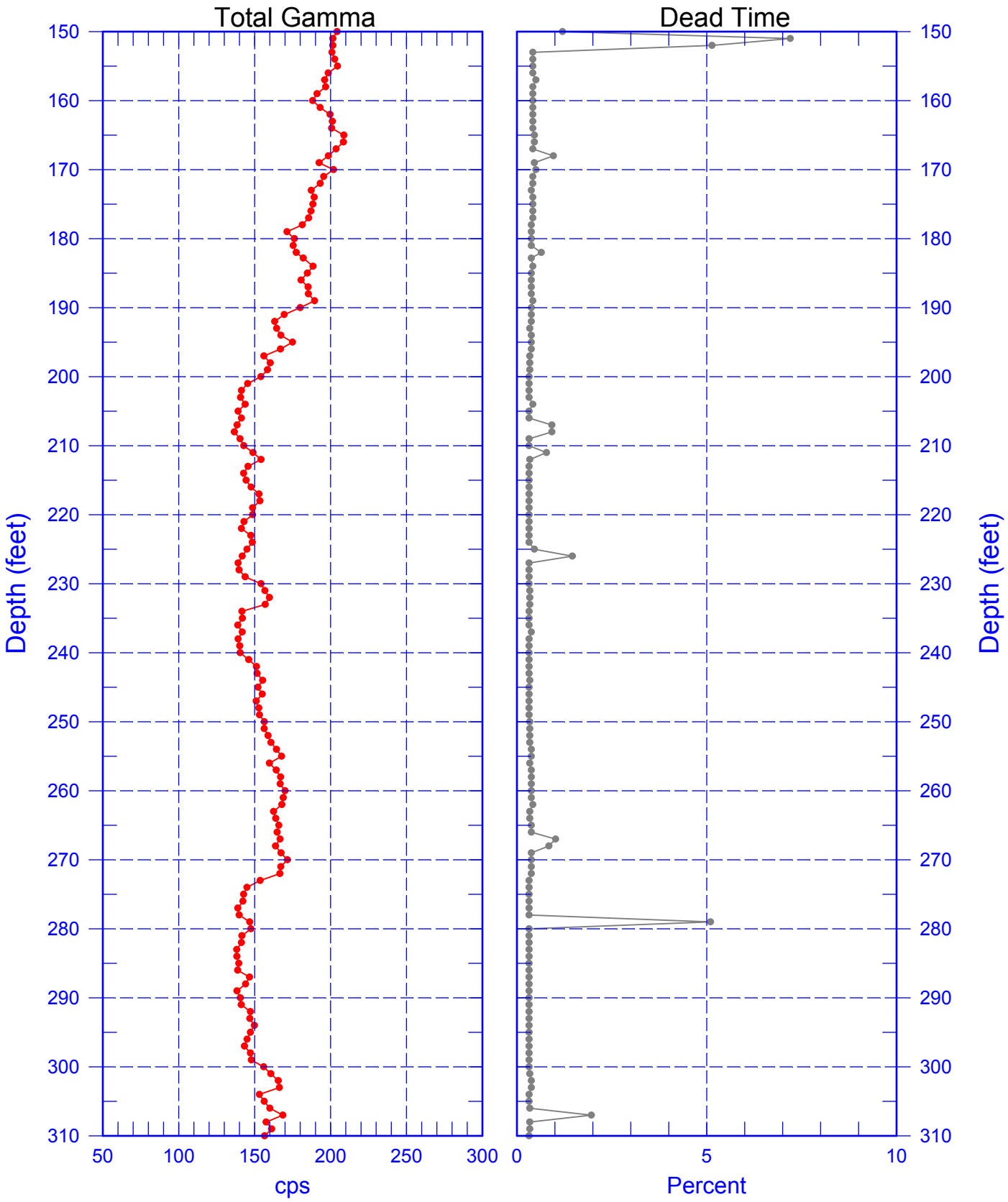
Total Gamma & Dead Time



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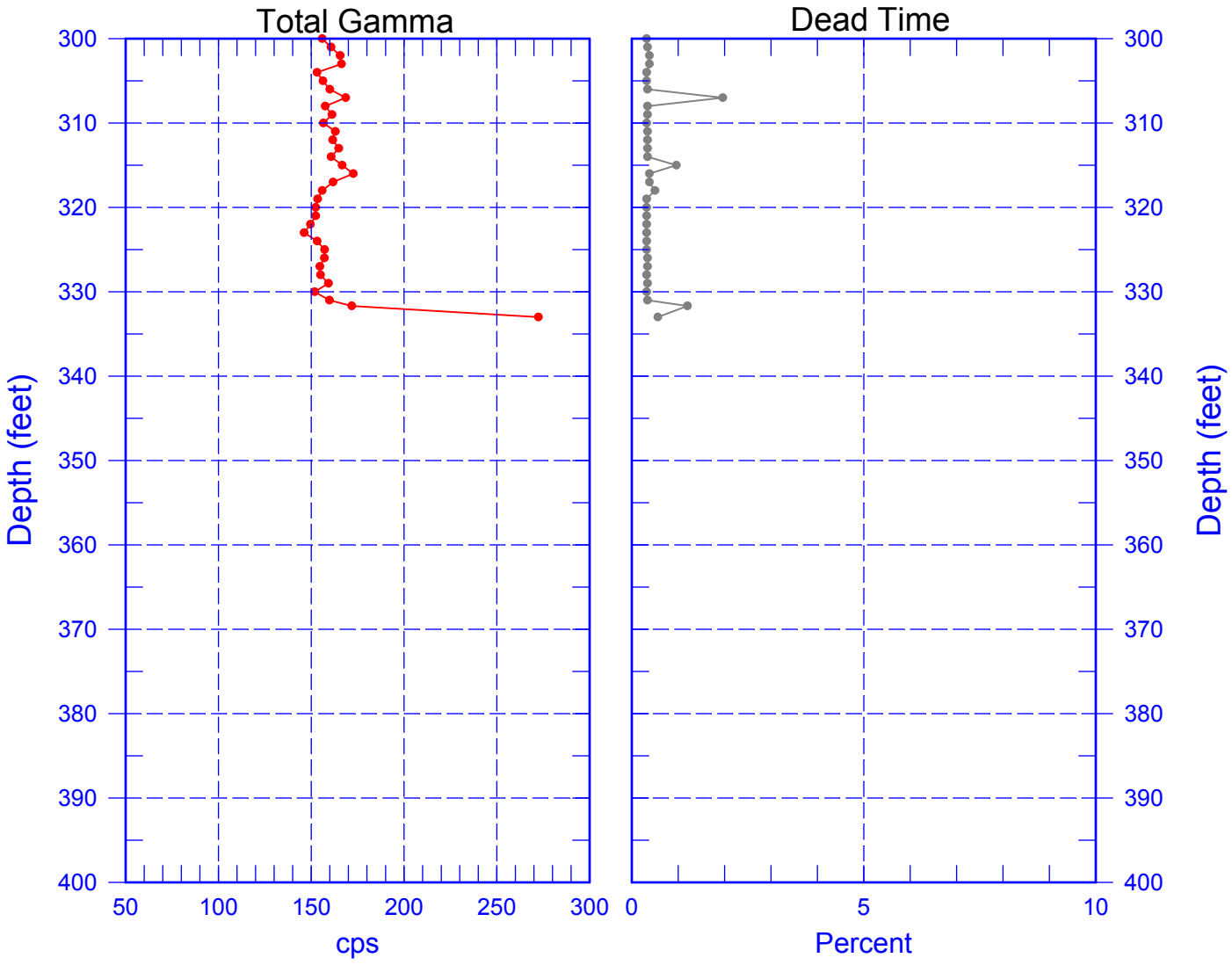

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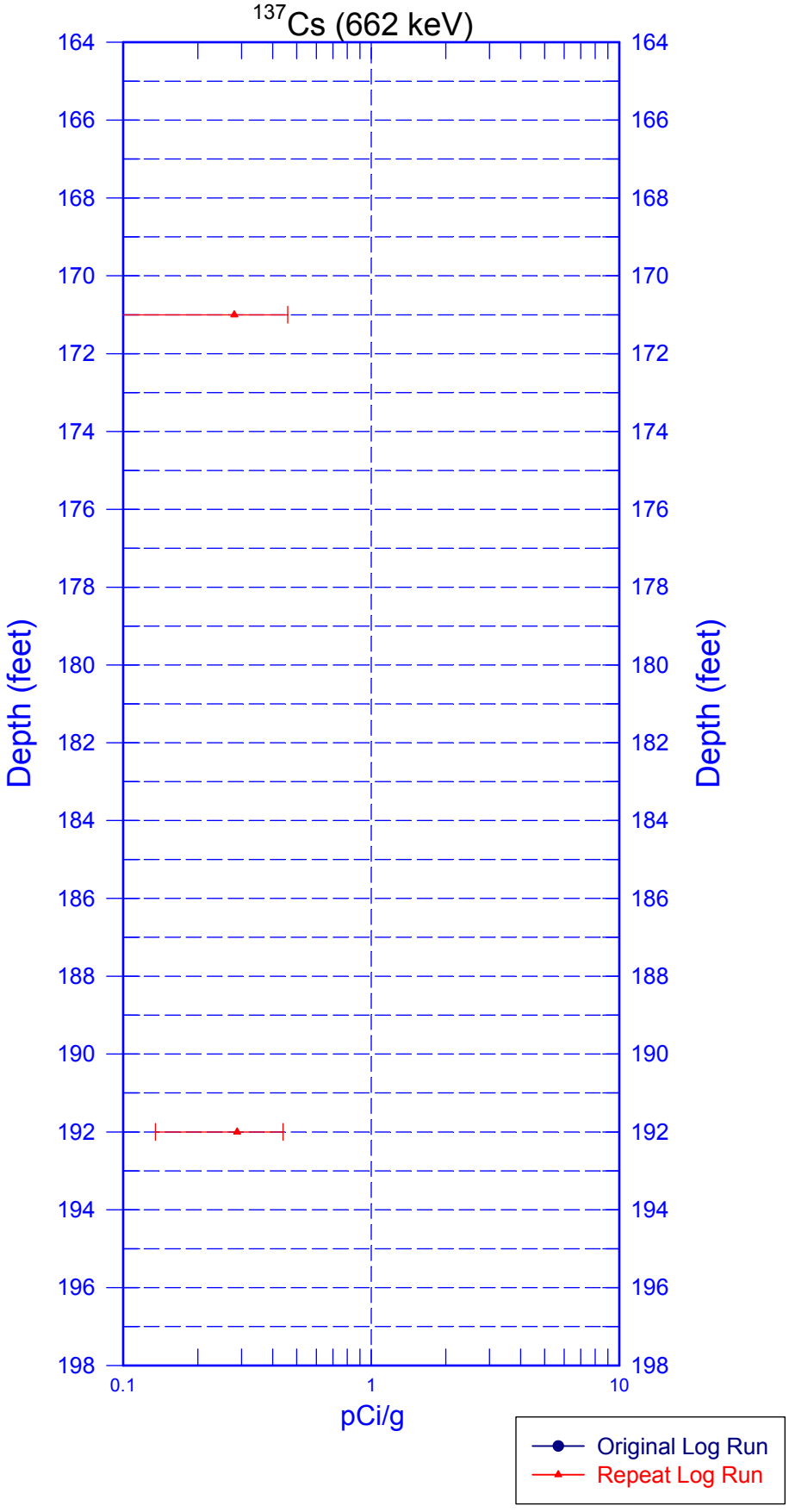
Rerun of Man-Made Radionuclides (198.0 to 164.0 ft)



299-E13-18 (A5863)

Rerun of Natural Gamma Logs (198.0 to 164.0 ft)